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## BRIEFER ARTICLES

### A FREEZING DEVICE FOR THE ROTARY MICROTOME

(WITH ONE FIGURE)

A few years ago OSTERHOUT<sup>1</sup> figured and published an account of a simple freezing device to be used in connection with various sorts of sliding microtomes. Later<sup>2</sup> he published an account of a simple freezing microtome in which he made use of a knife of a plane for cutting on account of its rigidity. In each of these devices, the freezing chambers being stationary, they are both adaptable to the use of brine, carbon dioxide, or other substances for freezing. These devices have been of considerable service in the preparation of sections of living tissues. However, if one wishes sections in large quantity and of uniform thickness, and particularly if thin sections are desired, it is found that a sliding microtome of almost any construction is inadequate, and to manipulate it requires considerable dexterity.

It occurred to the writer that the OSTERHOUT apparatus for freezing with brine might be modified in such a way as to make it usable with a rotary microtome of any make, and thereby increase its efficiency and enlarge the usefulness of both pieces of apparatus. The adaptation was made and the results have proven so satisfactory that a brief account of the apparatus seems desirable.

The accompanying photograph of the apparatus will serve as a basis for the description. It is simple and easy to construct, consisting of a 2×10 board 3.5 ft. long for the base, and 2 upright pieces fastened at the base and braced by a cross-piece about one-third of the distance up. A bolt passes through the base and the center of the cross-piece, and another through the upright pieces just above the cross-piece to make the apparatus firm. The upright has been lengthened in this case to receive larger receptacles than were originally used. The wheel is 20 inches in diameter and 1.5 inches thick, making the whole device about 5 ft. high. The wire to hold the pails is firmly fastened in the middle to the grooved wheel. The rubber tubing is of stiff white rubber. When

<sup>1</sup> OSTERHOUT, W. J. V., A simple freezing device. *BOT. GAZ.* 21:195-201. *figs. 6.* 1896.

<sup>2</sup> ———, Univ. Calif. Publ. Bot. 2:73. 1904.

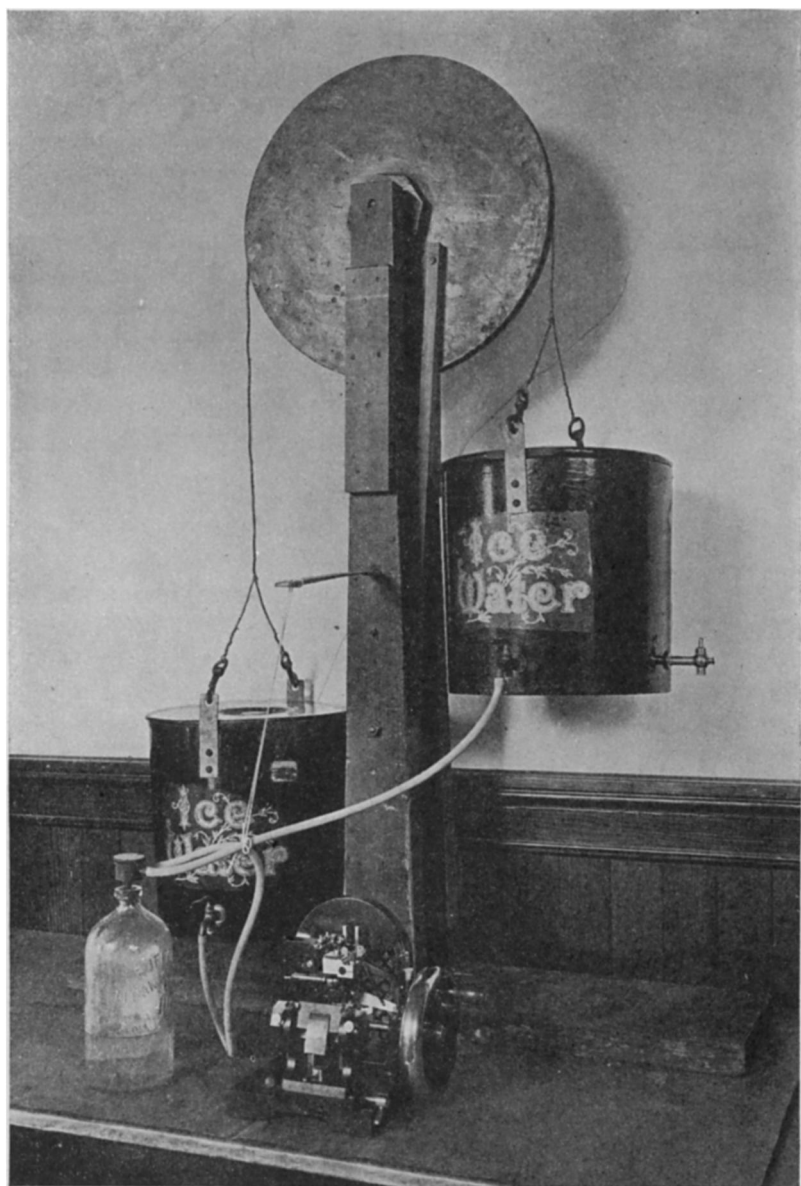


FIG. 1

the freezing mixture is put in, the 2 pails should balance. An important though simple detail is the proper adjustment of the brace to hold one of the pails up until the water runs through the tubes and freezing box into the other pail. This, as is shown in the accompanying illustration, is made of a piece of hard wood about 0.75 inch square, fastened at the upper end to the wheel by a heavy screw, the hole in the brace being large enough so that it may move freely. The brace must be long enough for its lower end to rest on the cross bar when the lower pail is about 3 inches above the base board. When the lower pail receives over half of the water it will move slowly to the base board, the lower end of the brace will pass over the cross bolt and hang perpendicularly by the side of the higher pail. As soon as this pail is emptied it should be lowered, and this should be attended to with promptness, for it is necessary that the water be kept in constant circulation to obtain the maximum freezing efficiency.

A very important part of the apparatus of course is the freezing chamber. This will have to be made to order to fit the particular microtome one is using, and the size depends upon one's needs. The one which seems to be of general use and which is employed by the writer is constructed as follows: A rod of brass about 2.25 inches long is hollowed out about 1 inch deep for the chamber, leaving walls thick enough so that a firm cap can be screwed on. The other end of the rod is trimmed down, making a stem of the desired size to fit the particular microtome. Two tubes with inside diameters 7-8 mm. and 0.75 inch long are welded into the chamber a few millimeters apart on one side. The faucets, one in each pail, should be large enough for a free flow of the water into the tubes and should be shielded on the inside of the pail by copper gauze. A second faucet should be put into one pail to be used to remove surplus water.

The freezing chamber, of course, must be in a horizontal position while the object is being frozen. A half gallon bottle with a hole in the cork large enough to receive the stem as shown in the illustration is very convenient.

It is highly desirable to have a section collector if one is cutting much material. This may be made of a block of wood about 1 inch thick, hollowed out on one side, leaving enough margin on 3 edges around the cavity so that it will fit snugly against the knife, a little vaseline being used to prevent leaking. The box may be clamped on in various ways. If this chamber is nearly filled with cold water, the sections will slide down into it and melt, after which they may all be poured out together

by removing the knife carrier and all attached thereto from the remainder of the machine. Gum arabic of medium consistency is used to freeze the objects in. A layer 2-3 mm. thick should be frozen on the chamber before placing the object on for cutting. By this means it is possible to obtain a large number of sections in a very short time, greatly facilitating the study of algae, fungi, and other soft tissues of either plants or animals in which only cell forms and cell relations are being studied. Likewise it is exceedingly useful in preparing cross and longitudinal sections of leaves, soft stems, etc., for class use. It is also inexpensive. One can run the machine 8 hours with no difficulty on 40 lbs. of ice.

In orienting the material for cutting, 2 methods may be followed. Segments of the material may be piled on top of each other on the freezing chamber and covered with gum arabic and frozen. After trimming to the desired form the material may then be removed, properly oriented, and quickly refrozen to the chamber. This is desirable only in cases in which the material is too delicate to stand on end or on edge if cross-sections are to be made. In the other method one takes the material, for example, segments of leaves a few millimeters long, dampens them in gum arabic, and piles them one upon another on a knife blade, after which the whole pile is tipped over onto smooth frozen gum on the freezing chamber. With a little care the whole pile may be made to stand on edge and may be frozen in position for cutting cross-sections.—N. L. GARDNER, *University of California*.